Patent Application

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Before the Board of Patent Appeals and Interferences

In re application of **Martin BRODT** et al. Confirmation No.: **7612**

Appln. No.: **10/527,721** Art Unit: **1793**

Filed: **10/20/2005** Examiner: **Jie YANG**

For: **PRESS-HARDENED PART AND METHOD FOR THE PRODUCTION THEREOF**

Attorney Docket No.: **3926-144** Customer No.: **41288**

Hon. Commissioner for Patents
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

This is an appeal from the final rejection in the Office action dated October 28, 2008, finally rejecting claims 1-13.

Appellants submit this Appeal Brief, including credit card payment in the amount of $540.00 to cover the fee for filing the Appeal Brief and $130.00 for one month extension of time. A Notice of Appeal was filed on February 27, 2009, making the Brief due April 27, 2009.

Real Party in Interest:

This application is assigned to Daimler AG of Stuttgart, Germany. The assignment has been recorded by the USPTO on August 14, 2006, at Reel No. 018101, Frame No. 0477.

Related Appeals and Interferences:

No related appeals or interference proceedings are currently pending which would directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

Status of Claims:

Claims 1-12 are rejected and are under appeal.

Claim 13 has been canceled.

Status of Amendments:

Claim 1 was amended after the final Office action. The Examiner stated in an *Advisory Action* dated February 2, 2009, that the request for reconsideration had been considered but claims 1-12 remain rejected; however, for purposes of appeal the proposed amendments would be entered. *A Notice of Appeal* was filed on February 27, 2009.

Summary of the Claimed Subject Matter:

Claim 1 is the only independent claim.

The present invention addresses the problem of how to provide a dimensionally true, hardened shaped part by a simplified and economical process, and in particular, concerns forming of high-strength and super-high-strength steel materials, which are increasingly used in order to meet weight reduction, rigidity and strength requirements for, e.g., body panels of automobiles (specification, paragraph [0004]).

It is known to cut a sheet blank from a coil, to heat this sheet blank above the structural transformation temperature (above which the material structure is in the austenitic state), to insert the blank in the heated state into a forming tool, and to form the sheet into

the desired part shape and cool it while mechanically fixing the desired forming state, thereby hardening the part (specification, paragraph [0005]).

However, now comes the problem of trimming the hardened part in a dimensionally accurate manner. This requires expensive equipment and results in burrs which may lead to rapid crack formation. Alternative cutting methods (laser cutting or water-jet cutting) are expensive and work comparatively slowly (specification, paragraphs [0006]- [0007]).

As explained in paragraph [0010] of the specification, the essence of the invention consists in the idea that the process should be configured in such a way that the costly final trimming of the hardened part can be dispensed with.

The present invention solves the problem by:

- cold forming the sheet blank to a near net shape having (approximately) the desired three-dimensional shape and (approximately) the desired outer contour of the finished part. *(claim 1, step II; specification, paragraphs [0011] and [0016]);*
- trimming marginal material from the still soft, nearly shaped part *(claim 1, step (III))*; and
- heating the approximately shaped part to a temperature above the forming temperature of the material, and transferring the part in the hot state into a hot-forming tool, in which the part is press-hardened and is at the same time subjected to a specific heat treatment, in the course of which hardening is effected *(claim 1, steps (IV) and (V): heating and press-hardening the trimmed part blank (17) in a hot-forming tool (23), final shaping the heated product of step (IV) and rapidly in a hot-forming tool (23) to set the material structure).* Thereby a dimensionally accurate hardened part is formed, with the trimming step however having been effected on the soft, near net shape part, prior to hardening.

Additional advantages associated with the inventive process include:

- a first cold forming process while the metal is still in the soft state allows forming more complex geometries in comparison to hot-forming;

- multiple passes can be made in cold forming, thus greater deformation can take place than with conventional hot forming (specification paragraph [00015]);
- since the trimmed part already has dimensions near to the net shape, only a slight adaptation of shape is necessary during the hot forming, and thus wear on the hot-forming tool is reduced, saving costs (specification paragraph [0014]);
- since the part margins are changed only slightly, there is no need for final trimming of the part margins, thus a high-quality cut edge is achieved (specification, paragraph [0013]); and
- the heated, trimmed part is finish-shaped and rapidly cooled in the hot-forming tool (e.g., the hot-forming tool cooled with brine - see claim 5), as a result of which a fine-grained martensitic or bainitic material structure is set, and high dimensional accuracy is achieved.

Grounds of Rejection to be Reviewed on Appeal:

1. Whether claims 1, 6, 10-11 are properly rejected under 35 U.S.C. §102(e) as anticipated by Tjoelker et al (US 6,918,224 B2).

2. Whether claims 2-4 and 12 are properly rejected under 35 U.S.C. §103(a) as being obvious over Tjoelker et al as applied on claim 1, and further in view of term definition for "stamping" on Wikipedia (www.wikipedia.org).

3. Whether claims 5 and 7-9 are properly rejected under 35 U.S.C. §103(a) as being obvious over US '224 as applied on claim 1, and further in view of Bronsema et al (US 5,669,992, thereafter US'992) for the same reason as stated in the office action of 2/21/2008.

Argument:

1. **Claims 1, 6, and 10-11 are not anticipated by Tjoelker et al (US 6,918,224 B2).**

To anticipate, a cited reference must teach every element of the rejected claims. Independent claim 1 defines a method of producing a press-hardened metallic shaped part, comprising the following method steps:

(I)- providing a sheet blank of a hot-workable steel sheet;

(II)- cold forming a part blank (10) having a three-dimensional shape and outer contour corresponding approximately to that of the finished product from the sheet blank (2);

(III)- trimming the part blank (10) at the margins to a marginal contour (12') approximately corresponding to the part (1) to be produced;

(IV)- heating and press-hardening the trimmed part blank (17) in a hot-forming tool (23); and

(V)- final shaping the heated product of step (IV) and rapidly cooling the trimmed part blank (17) in a [*should be "the"*] hot-forming tool (23) to set the material structure.

Tjoelker et al do not teach steps (III)-(V). Thus, Tjoelker et al do not anticipate and do not teach how to provide a dimensionally true, hardened shaped part by a simplified and economical process involving the above claim limitations.

More specifically, Tjoelker et al merely teach (a) cold forming to final shape in a single step, followed by (b) heat *treating* (not heat *forming*).

At col. 1, line 35, Tjoelker et al in fact teach disadvantages associated with hot forming, and teach sidestepping these disadvantages by avoiding hot forming. Thus, Tjoelker et al in fact teach away from the present invention.

Tjoelker et al nowhere teach

- a first cold forming step in which an unhardened sheet is formed to a **near net shape** but not a final shape (a part blank shape "having a three-

dimensional shape and outer contour corresponding approximately to that of the finished product"- claim 1, step II),

- followed by **trimming** the marginal contour of the soft near net shape part to approximately correspond to the part (1) to be produced,
- followed by a **final shaping step** in which the heated part is formed to it's **final shape** and also **hardened** by rapidly cooling to set the material structure.

At best, Tjoelker et al teach a heat ***treatment*** step in which a previously cold shaped part is

- fixtured in a clamping device, and
- subjected to selective induction heating (while being fixtured in the clamping device to avoid warping)(col. 4, line 27 – col. 5, line 20).

In Tjoelker et al the part is clearly already finally shaped before any heat treatment step, and the clamping device in which the part is held during heat treatment is simply used to prevent any change of shape during heat treatment. The clamping device is not used for shaping, but rather, is used to preclude undesired warping of the part.

No explicit disclosure of trimming is found in Tjoelker et al. If one were to infer that the initial part formation (stamping, cutting, whatever) might involve a "trimming" of the soft (unhardened) un-shaped part prior to shaping and heat treating, Appellants point out that the present claims require trimming after the initial step of cold forming. If one were to infer in Tjoelker et al some "trimming" after cold forming, this interpretation of Tjoelker et al leads to a different problem – heat treating a shaped/trimmed part results in thermal warpage of the part (which is apparently why Tjoelker et al clamp the part prior to heat treatment), thus this process can only be used where high dimensional accuracy is not required.

Compare paragraphs [00033]-[00034] of the specification as filed. According to the present invention, the part gets both it's final hardened material structure and it **final shape** during the hot forming steps (IV)-(V).

Accordingly, Tjoelker et al nowhere teach the limitations necessary to achieve the present invention as claimed in claim 1.

Reversal of the rejection is respectfully requested.

2. Claims 2-4 (deep drawing; mechanical cutting; simultaneous) and 12 (drawing) are not obvious over Tjoelker et al as applied on claim 1, and further in view of term definition for "stamping" on Wikipedia (www.wikipedia.org).

Even if one were to accept the position of the Examiner that, according to Wikipedia, stamping includes drawing, thus Tjoelker et al can be understood to suggest forming and drawing prior to heat treating, still, the teaching is not sufficient to reach the present invention, which requires not only a first step of cold forming to a near net shape, but also a step of hot forming with heat treating to a dimensionally accurate, hardened shape.

As discussed in the present specification, it is known to press-form a soft sheet blank, and then to harden the three dimensional formed shape, and finally to trim the margins from the hardened shape. However, trimming the margins in a dimensionally accurate manner requires expensive equipment (laser cutting or water-jet cutting), is comparatively slow, and results in burrs which may lead to rapid crack formation. As indicated in paragraph [0010] of the present specification, the essence of the invention consists in the idea that the part production process should be configured in such a way that the costly final trimming of the hardened part can be dispensed with. According to the invention:

- a sheet blank is formed to near net shape in a cold forming process,
- the marginal regions are trimmed off the still soft near-net-shape part,
- the trimmed part is heated (to a temperature above the structural transformation temperature in the austenitic state); and
- the heated part is subject to a final shaping and rapid cooling in a hot-forming tool to set the shape and material structure

Since the part is first shaped in a cold forming process, more complex geometries can be formed in comparison to hot-forming (specification paragraph [00015]). Further, multiple passes can be made in cold forming, thus greater deformation can take place than with conventional hot forming (specification paragraph [00015]). Since the trimmed part already has dimensions near to the final shape, only a slight adaptation of shape is necessary during the hot forming, and thus wear on the hot-forming tool is reduced, saving costs (specification paragraph [00013]). In the hot-forming tool the trimmed part is finish-shaped

and rapidly cooled (e.g., the hot-forming tool is cooled with brine), as a result of which a fine-grained martensitic or bainitic material structure is set, and high dimensional accuracy is achieved. Since the near net shape part was trimmed preceding the hot-forming process, and on account of the adaptation of shape of the outer margin in the hot-forming tool, the part already has the desired outer contour after completion of the hot-forming process, so that no expensive and time-consuming trimming of the part margin is necessary after the hot forming.

The prior art does not teach such an advantageous process.

According to the Examiner, Tjoelker et al teach a process for forming a vehicle component comprising the steps of

- cold forming unhardened steel into a workpiece having mounting surfaces;
- selectively fixturing the mounting surfaces;
- static induction heating the workpiece with lengthwise surface eddy currents on selected portions; followed by
- quenching of the fixtured heated workpiece to form strengthened portions; and
- unfixturing the resulting components.

Tjoelker et al are thus missing the essential features of the present invention, and merely teach cold forming unhardened steel stock (i.e., a single forming step, col. 1, line 67; col. 4, line 14), followed by induction heat treating the steel (i.e., heat treating but not heat forming, col. 2, line 1; col. 3, line 50; col. 4, line 54). Tjoelker et al show in Fig. 4-6 and associated text (col. 4 lie 27- col. 5, line 20) that during the heat treatment the working piece is clamped only at its end portions. This does not produce a final heat-treated shaped part with high dimensional accuracy.

Nowhere do Tjoelker et al teach how to provide a dimensionally true, hardened shaped part by a simplified and economical process and yet avoid the problem of having to trim a shaped hardened part. Tjoelker et al in particular do not teach press hardening in a hot forming tool as necessary for producing a dimensionally true, hardened shaped part, and thus can not teach or suggest the advantages associated with the present inventive combination cold forming to a near net shape followed by trimming and press-hardening in a hot forming tool to produce a dimensionally accurate, hardened part requiring no trimming of hardened sheet metal.

Further, at col. 1, line 35, Tjoelker et al in fact teaches disadvantages associated with hot forming, and teaches overcoming these disadvantages by avoiding hot forming. In fact, considering the part shown in Tjoelker et al, it is not possible to press-harden this whole workpiece, but only the central portion of the beam. Thus, Tjoelker et al teaches against the present invention which requires a combination (a) cold forming to a near net shape followed by (b) press-hardening in a hot forming tool.

In contrast, as claimed in present claim 1, a part is shaped – approximately (to a near net shape) - in a first cold forming process while the metal is still in the soft state. Thereby, more complex geometries can be formed in comparison to a conventional shaping process having only a hot-forming step. Further, multiple passes can be made in cold forming, thus greater deformation can take place than with conventional hot forming (specification paragraph [00015]). Thereafter, the part is trimmed, and finally, hot formed.

As pointed out by the Examiner, Tjoelker et al teaches the workpiece is forcefully cold formed at substantially ambient temperature from non-hardened steel, such as by stamping and/or rolling techniques of conventional type, into the desired configuration (Col.4, lines 14-25 of Tjoelker et al). The term definition for "Stamping" in Wikipedia is: "Stamping is a metalworking process by which sheet metal strips are punched using a press tool which is loaded on a machine press or stamping press to form the sheet into a desired shape and the most common stamping operation are: piercing; fine blanking; bending; forming; coining; progressive stamping; deep drawing; embossing; and extrusion". Because stamping includes drawing (or deep drawing) method as recited in the instant claims, the Examiner takes the position that it would have been obvious to one skilled in the art to choose drawing (as claimed in the instant claim 12) or deep drawing (as claimed in the instant claim 2) to cold forming the workpiece because Tjoelker et al discloses the same utility throughout the disclosed stamping. Because stamping also includes extrusion technique, which is also known as a mechanical cutting (or trimming) method, it would have been obvious to one skilled in the art to choose a trimming technique for cold forming as recited in the instant claims 3-4 in the process of Tjoelker et al in order to obtain the desired configuration (Col.4, lines 14-25 of Tjoelker et al).

In response, Appellants point out, as explained in detail above, the present invention requires not only that the sheet blank is formed to near net shape in a cold

forming process, with trimming prior to heat treatment, but also a second step of heating and final shaping by press-hardening in a hot forming tool and rapid cooling in the hot-forming tool to set the material structure.

As discussed above, while Tjoelker et al teach cold forming, Tjoelker et al teach against hot press forming.

Wikipedia disclosure of drawing or deep drawing as forms of cold forming does not come any closer to the present invention since there remains an absence of teaching of hot press forming.

Further, the present specification teaches inherent advantages that can be achieved by the present process, which advantages can not be achieved using he process of Tjoelker et al. Since, in the present invention, the part is shaped in a cold forming process, more complex geometries can be formed in comparison to hot-forming (specification paragraph [00015]). Further, multiple passes can be made in cold forming, thus greater deformation can take place than with conventional hot forming (specification paragraph [00015]). Since the trimmed part already has dimensions near net shape, only a slight adaptation of shape is necessary during the hot forming, and thus wear on the hot-forming tool is reduced, saving costs (specification paragraph [00013]). In the hot-forming tool the trimmed part is finish-shaped and rapidly cooled (e.g., the hot forming tool is cooled with brine), as a result of which a fine-grained martensitic or bainitic material structure is set, and high dimensional accuracy is achieved. Due to the fact that the near net shape part is trimmed preceding the hot-forming process and on account of the adaptation of shape of the outer margin in the hot-forming tool, the part already has the desired outer contour after completion of the hot-forming process, so that no time-consuming trimming of the part margin is necessary after the hot forming.

Accordingly, claims 2-4 (deep drawing; mechanical cutting; simultaneous) and 12 (drawing) are not obvious over Tjoelker et al combined with Wikipedia.

Reversal of the rejection is respectfully requested.

3. Claims 5, 7-9, are not obvious over US '224 as applied on claim 1, and further in view of Bronsema et al (US 5,669,992, thereafter US'992), with US'224 applied on claims 5 and 7-9 for the same reason as stated in the office action of 2/21/2008.

Appellants first point out that Bronsema et al nowhere teaches hot press forming as required in present claims 1 steps (IV) and (V), thus this combination of references does not come close to the present invention.

According to the Examiner, regarding claim 5, Tjoelker et al teaches using induction heat to treat the steel and quenching in quench tank unit to obtain desired hardening effect (Col.5, lines 9-20 of US'224). Appellants point out that this is not hot press forming which is an essential requirement of the present invention and the present claims.

The Examiner concedes that Tjoelker et al do not specify being cooled with brine. However, it is within the ordinary skill in the art to choose different quenching solutions for getting desired hardening effect, which is evidenced by Bronsema et al.

In response, Appellants point out that brine is claimed as the heat transfer (removal) medium for cooling a hot-forming tool. Since the cited references do not teach use of a hot forming tool for press hardening, the refernces can not suggest the present invention.

Bronsema et al is next cited for teaching a method for manufacturing an automobile bumper beam (Col.1, lines 4-7 of Bronsema et al). Bronsema et al teaches induction hardening method (Col.3, lines 25-46 of Bronsema et al 2). Bronsema et al teaches using water solution containing various salts as quenching solution. Therefore, it would have been obvious to one skilled in the art to choose brine as a quenching solution as recited in the instant claim in the process of US'224 in order to obtain desired hardening effect as demonstrated in Bronsema et al.

In response, Appellants again point out that present invention is based on superior results obtained by the combination of (a) cold forming to a near net shape followed by (b) press-hardening in a hot forming tool for final shaping the part and setting the material structure. Since the cited references do not teach use of a hot forming tool for press hardening, the refernces can not suggest the present invention.

Regarding claims 7 and 8, Bronsema et al is cited for teaching: "The atmosphere chamber exposes the steel S to only inert gas during these functions to prevent oxidation and the formation of scales on the steel surface so that the bumper beam can be later painted, if desired." (Col.3, lines 30-34 of Bronsema et al).

In response, Appellants again point out that present invention is based on superior results obtained by the combination of (a) cold forming to a near net shape followed by (b) press-hardening in a hot forming tool, which is nowhere taught in the combination of references.

Regarding claim 9, Tjoelker et al is cited for teaching using induction heat to treat the steel (Fig. 1-5 and Col.4, line 53 to col.5, line 20 of Tjoelker et al), Bronsema et al teaches induction heating furnace and Bronsema et al teaches the bumper beam is treated continuously (Fig.1-3 and Col.3, lines 25-47 of Bronsema et al). Therefore, it reads on the claimed features.

In response, Appellants again point out that present invention requires the combination of (a) cold forming to a near net shape followed by (b) press-hardening in a hot forming tool. No combination of teaching from these references leads one to expect the benefits obtained by the present invention.

Reversal of the rejection is respectfully requested.

Conclusion

In view of the forgoing, the honorable Board is therefore respectfully urged to reverse the final rejection of the Primary Examiner.

The Commissioner is hereby authorized to charge any fees which may be required at any time during the prosecution of this application without specific authorization, or credit any overpayment, to Deposit Account Number 16-0877.

Respectfully submitted,

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Date: **April 28, 2009**

Claims Appendix:

1. A method of producing a press-hardened metallic shaped part, comprising the following method steps:

(I)- providing a sheet blank of a hot-workable steel sheet;

(II)- cold forming a part blank (10) having a three-dimensional shape and outer contour corresponding approximately to that of the finished product from the sheet blank (2);

(III)- trimming the part blank (10) at the margins to a marginal contour (12') approximately corresponding to the part (1) to be produced;

(IV)- heating and press-hardening the trimmed part blank (17) in a hot-forming tool (23); and

(V)- final shaping the heated product of step (IV) and rapidly cooling the trimmed part blank (17) in a hot-forming tool (23) to set the material structure.

2. The method as claimed in claim 1, wherein a deep-drawing method is used for shaping the part blank (10) from the sheet blank (2).

3. The method as claimed in claim 1, wherein the part blank (10) is trimmed by a mechanical cutting method (15).

4. The method as claimed in claim 3, wherein the trimming of the part blank (10) is effected as part of the cold forming.

5. The method as claimed in claim 1, wherein the tool (23) is cooled with brine.

6. The method as claimed in claim 1, wherein the sheet blank (2) is made of an air-hardened steel alloy.

7. The method as claimed in claim 1, wherein the heating and hot forming of the trimmed part blank (17) are effected in an inert-gas atmosphere (26).

8. The method as claimed in claim 7, wherein

(IV) - the part (1) is cooled after the hot forming down to a temperature below the martensite temperature, and is provided immediately afterward with a surface coating, in particular an anti-corrosion coating.

9. The method as claimed in claim 1, wherein the heating of the trimmed part blank (17) in process step (IV) is effected in a continuous furnace (21).

10. The method as claimed in claim 1, wherein the heating of the trimmed part blank (17) in process step (IV) is effected inductively.

11. A method according to claim 1, wherein said metallic shaped part is a motor vehicle body part.

12. A method according to claim 1, of producing a metallic shaped part, wherein said cold-forming method is a drawing method.

Evidence Appendix:

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or any other evidence has been entered by the Examiner and relied upon by appellant in the appeal.

Related Proceedings Appendix:

No prior or pending appeals, interferences or judicial proceedings are in existence which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal. Accordingly, no copies of decisions rendered by a court or the Board are available.